

IN THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) An apparatus for canceling an image signal from a received radio frequency signal, the apparatus comprising:

A3 a ring oscillator for producing a radio frequency signal having in-phase and quadrature phase components, said ring oscillator including a plurality of delay cells, an output of each delay cell being coupled to an input of another delay cell, one of the couplings between delay cells being cross-coupled so that the output of one delay cell is inverted prior to input into another delay cell;

a first mixer having inputs configured to receive the in-phase component and the received radio frequency signal and outputting an in-phase signal;

a second mixer having inputs configured to receive the quadrature phase component and the received radio frequency signal and outputting a quadrature phase signal;

a phase shift device coupled with one of the said mixers for receiving an output of the said one mixer and outputting a phase shifted signal; and

a combiner, operatively coupled to the other of the said mixers and said phase shift device, for producing an image cancelled signal.

2. (Currently amended) The apparatus of claim 1 wherein ~~the~~ said phase shift device is coupled to ~~the~~ said second mixer.

3. (Currently amended) The apparatus of claim 2 wherein ~~the~~ said phase shift device shifts a phase of ~~the~~ said second mixer output by ninety degrees.

A3 4. (Currently amended) The apparatus of claim 1 wherein ~~the~~ said ring oscillator ~~comprises~~ includes four delay cells, ~~an output of each delay cell is coupled to an output of another of the delay cells.~~

5. (Currently amended) The apparatus of claim 4 1 wherein each delay cell delays its input by forty-five degrees ~~and one of the couplings is cross-coupled so that the output of one of the delay cells is inverted prior to input into another of the delay cells.~~

6. (Currently amended) The apparatus of claim 1 wherein ~~the~~ said first mixer and ~~the~~ said second mixer are ~~gilbert~~ Gilbert cells.

7. (Currently amended) A receiver for use in a wideband communication system, ~~the~~ said receiver capable of canceling an image signal from a received radio frequency signal, ~~the~~ said receiver comprising:

a ring oscillator for producing a radio frequency signal having in-phase and quadrature phase components, said ring oscillator including a plurality of delay cells, an output of each delay cell being coupled to an input of another delay cell, one of the couplings between delay cells being cross-coupled so that the output of one delay cell is inverted prior to input into another delay cell;

A3 first mixing means for mixing the in-phase component with the received radio frequency signal and outputting an in-phase signal;

second mixing means for mixing the quadrature phase component with the received radio frequency signal and outputting a quadrature phase signal;

means for receiving one of ~~the~~ said mixer's phase signals and outputting a phase shifted signal; and

means for combining the phase shifted signal with the other phase signal ~~other than the one phase signal~~ to produce an image canceled signal.

8. (Currently amended) The receiver of claim 7 wherein ~~the~~ said means for outputting a phase shifted signal shifts the one phase signal by ninety degrees in phase.

9. (Currently amended) The receiver of claim 7 wherein ~~the~~ said ring oscillator ~~comprises~~ includes four delay cells, ~~an input of each delay cell is coupled to an output of another of the delay cells.~~

10. (Currently amended) The receiver of claim ~~9~~ 7 wherein each delay cell delays its input by forty-five degrees ~~and one of the couplings is cross-coupled so that the output of the delay cell is inverted prior to input into another of the delay cells.~~

A3 11. (Currently amended) The receiver of claim 7 wherein ~~the~~ said means for outputting a phase shift signal is coupled to ~~the~~ said first mixing means.

12. (Currently amended) The receiver of claim 7 wherein ~~the~~ said first and second mixing means ~~comprises~~ includes a ~~gilbert~~ Gilbert cell.

13. (Currently amended) A method for canceling an image signal from a received radio frequency signal, ~~the method~~ comprising the steps of:

providing a ring oscillator;

producing a radio frequency signal having in-phase and quadrature phase components with the ring oscillator;

mixing the in-phase component and the received radio frequency signal to produce an in-phase signal;

mixing the quadrature phase component and the received radio frequency signal to produce a quadrature phase signal;

shifting a phase of one of the mixed phase signals ~~produced by mixing the components~~ to produce a phase shifted signal; and

combining the phase shifted signal with the other mixed phase signal ~~produced by mixing the components other than the one phase signal~~ to produce an image canceled signal.

14. (Original) The method of claim 13 wherein the one phase signal is the quadrature phase signal.

15. (Original) The method of claim 13 wherein the phase shifting is by ninety degrees in phase.